1. One day in gym class, the PE teacher says that everyone should run a mile. However, an evil force appears and tries to stop you from completing the mile and returning to your other classes. The force has the following effect:

   Once you’ve traveled some distance $d$ from the starting line, a force field appears at distance marker $2d$. You cannot get past this force field.

   For example, if you have traveled $1/4$ of a mile, a force field appears at the $1/2$ mile point.

   How much of the mile can you run before being stopped by the force field?

   You can’t even start. If students are having difficulty with this, they can be guided toward the answer with questions like “Can you reach the $1/4$ of a mile point? What about the $1/8$ of a mile point?”

2. One day, as you are walking home from school, a genie suddenly appears in front of you. The genie gives you a magical lamp that can turn itself on and off. You take the lamp home, and you quickly discover there is something very unusual about this lamp:

   If you turn the lamp on, it turns itself off after one minute has passed.

   After the next half minute has passed, the lamp turns itself on.

   After the next quarter of a minute, the lamp turns itself off.

   After the next eigth of a minute, the lamp turns itself on again.

   In fact, the lamp continues to turn itself off and on an infinite number of times in this same pattern.

   Does the lamp ever stop turning itself on and off once you have turned it on? If so, when does the lamp stop? If not, why not?

   The lamp will have stopped after two minutes have passed. One can get the students to figure out that the lamp will stop by asking questions like if the lamp will still be on after 10 minutes or not.

   Once the students realize the lamp will stop, the instructor can also ask the students whether the lamp is on or off. There is no way to know that answer to this question!

   The instructor can also remark that such a magical lamp is sometimes referred to as Thompson’s lamp, due to the person who first contemplated this scenario. The lamp is an example of an infinity machine, which is something that can accomplish infinitely many tasks in a finite amount of time. If there is extra time at the end of a session, students could be asked to come up with other examples of infinity machines or paradoxes like this.